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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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FAY, SHARPE, FAGAN, MINNICH & MCKEE, LLP
1100 SUPERIOR AVENUE, SEVENTH FLOOR
CLEVELAND, OH 44114

EXAMINER

IM, JUNGHWA M

ART UNIT PAPER NUMBER

2811

DATE MAILED: 03/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,126

Applicant(s)

STOKES ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 16 and 17 is/are rejected.
- 7) ☒ Claim(s) 14, 15 and 18 is/are objected to.
- 8) ☒ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/27/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of claim 1-18 in the reply filed on December 27, 2004 is acknowledged.

The traversal is on the ground(s) that claim 1 is generic with respect of all of the figures. This is not found persuasive. Note that the ground of restrict requirement is that the instant invention contains several embodiments which requires a separate search. For example, one embodiment describes a reflective electrode structure with a particular configuration of the insulating layer incorporated into a current spreading film which is not necessarily a layer of short period superlattice which is described in a second embodiment.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2 and 16-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Camras et al. (US 6784463), hereinafter Camras.

Regarding claim 1, Fig. 3A of Camras shows a flip chip light emitting diode die [100] including:

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a light-transmissive substrate [117; col.4, lines 64-66];

a plurality of semiconductor layers [216, 114, 112,116, 124]disposed on the light-transmissive substrate, the semiconductor layers including a p-type layer and an n-type layer [col. 4, lines 28-33], the semiconductor layers defining a device mesa; and

a reflective electrode [118; a reflective contact] disposed on the device mesa to energize the device mesa to produce light and to reflect the light produced by the device mesa toward at least one of the light-transmissive substrate and sides of the device mesa, the reflective electrode including electrical connecting material [118a; col. 6, lines 10- 29] disposed over at least selected portions of the device mesa and making electrical contact with the device mesa, the reflective electrode having laterally periodic reflectivity modulations (through having a waveform of reflectivity in terms of time).

Regarding claim 2, it is inherent that the periodic reflectivity modulations in Fig. 3A of Camras define a diffraction grating that provides a predetermined diffraction of the light produced by the device mesa since a diffraction grating is realized through the reflective electrode having a laterally periodic modulation.

Regarding claim 16, Fig. 7E of Camras shows an interface disposed between the plurality of semiconductor layers and the reflective electrode is roughened to scatter the reflected light toward the sides of the device mesa (col.13, lines 5-7).

Regarding claim 17, it is inherent that roughening in Fig. 7E of Camras includes a lateral periodicity defining a diffraction grating through having a waveform in terms of time(col. 13, lines 1-10).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-8 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Camras in view of Sawayama et al. (US 6788366), hereinafter Sawayama.

Regarding claim 3, Fig. 3A of Camras shows most aspect of the instant invention except “a light-transmissive dielectric layer laterally interspersed with the electrical connecting material.” Fig. 4 of Sawayama shows a reflective electrode [14] wherein a light-transmissive dielectric layer [5c] laterally interspersed with the electrical connecting material [12].

It would have been obvious to one ordinary skilled in the art at the time of the invention made to incorporate the teachings of Sawayama into the device of Camras in order to have the a light-transmissive dielectric layer laterally interspersed with the electrical connecting material to protect the reflective electrode.

Regarding claim 4, the combined structure resulting from Fig. 3A of Camras and the dielectric layer of Sawayama shows the electrical connecting material [118a] defines isolated regions, and an electrically conductive reflective layer [118c] disposed over the dielectric layer and the electrical connecting material, the reflective layer laterally electrical interconnecting the isolated regions of the electrical connecting material.

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Regarding claim 5, Fig. 4 of Camras shows an electrically conductive bondable layer [132; a solder layer] disposed on the electrically conductive reflective layer.

Regarding claim 6, Fig. 3 of Camras shows a current-spreading layer [124] disposed between the device mesa and the dielectric layer.

Regarding claim 7, Fig. 3 of Camras shows the current-spreading layer includes a light-transmissive electrically conductive layer (col. 7, lines 8-24).

Regarding claim 8, even though Camras discloses that the light-transmissive electrically conductive layer includes a thin film of light-absorbing material (through being a distributed Bragg reflector; col. 7, lines 16-19), but the combined teachings of Camras and Sawayama fail to show that "the thin film having a thickness of less than about 10 nm and greater than 70% light transmission." However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have "the thin film having a thickness of less than about 10 nm and greater than 70% light transmission" in order to improve the light transmission, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 10, Camras discloses that the current-spreading layer includes a topmost one or more of the plurality of semiconductor layers (through forming a part of a distributed Bragg reflector; col. 7, lines 16-19)

Regarding claim 11, it is obvious that the dielectric layer incorporated to the device of Camras with the teachings of Sawayama has a thickness selected to define an interference

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reflector optimized for a characteristic wavelength of the light produced by the device mesa as a practice for routine optimization.

Regarding claim 12, it is obvious that the interspersing of the electrical connecting material and the dielectric layer define a reflection diffraction grating optimized for a characteristic wavelength of the light produced by the device mesa since the waveform of the reflectivity is realized by the interspersing of the electrical connecting material and the dielectric layer

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Camras and Sawayama as applied to claim 8 above, and further in view of Ramdani et al. (US 5838707), hereinafter Ramdani.

Regarding claim 9, the combined teachings of Camras and Sawayama show most aspect of the instant invention except "the light-absorbing material is selected from a group consisting of nickel oxide, gold, indium tin oxide, and zinc oxide." Fig. 3 of Ramdani shows a reflective electrode [36; a distributed Bragg reflector] having a the light-absorbing material is selected from a group consisting of nickel oxide, gold, indium tin oxide, and zinc oxide (col. 5, lines 28-35).

It would have been obvious to one ordinary skilled in the art at the time of the invention made to incorporate the teachings of Ramdani into the device of Camras and Sawayama in order to have the light-absorbing material selected from a group consisting of nickel oxide, gold, indium tin oxide, and zinc oxide for a better reflectivity.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Camras and Sawayama as applied to claim 3 above, and further in view of Chua et al. (US 5838707), hereinafter Chua.

Reagrding claim 13, the combined teachings of Camras and Sawayama show most aspect of the insant invention except "the dielectric layer is selected from a group consisting of a silicon oxide, a silicon nitride, and a silicon oxynitride." Chua discloses a dielectric material formed in a reflective electrode [142 in Fig. 3; a distributed Bragg reflector] selected from a group consisting of a silicon oxide, a silicon nitride, and a silicon oxynitride(col. 7, lines 1-3).

It would have been obvious to one ordinary skilled in the art at the time of the invention made to incorporate the teachings of Chua into the device of Camras and Sawayama in order to have the dielectric layer is selected from a group consisting of a silicon oxide, a silicon nitride, and a silicon oxynitride since these dielectric materials are well known in the industry.

Allowable Subject Matter

Claims 14-15 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Prior art fails to teach or render obvious a semiconductor device with combinations of elements as set forth in the claims, including in particular a flip chip light emitting diode with the topmost one or more of the plurality of semiconductor layers of the dielectric layer including first portions having a first refractive index, and further including second semiconducting portions laterally interspersed amongst the first portions and having a second refractive index

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different from the first refractive index, the first portions and the second semiconducting portions cooperatively defining the topmost one or more of the plurality of semiconductor layers.

And additionally, Prior art fails to teach or render obvious a semiconductor device with combinations of elements as set forth in the claims, including in particular a flip chip light emitting diode with an insulating grid having openings at which the electrical connecting material is disposed and a reflective layer over the insulating grid and the electrical connecting material and electrically interconnecting the electrical connecting material at the openings wherein the roughened interface is an interface between the reflective layer and the insulating grid.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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